What is claimed is:

1. A phase change memory device, comprising:

a substrate;

a first electrode disposed over the substrate;

phase change material disposed over and in electrical contact with the first electrode;

a second electrode disposed over and in electrical contact with the phase change material, wherein electrical current passing through the first and second electrodes and the phase change material generates heat for heating the phase change material; and

insulation material disposed adjacent to the phase change material, wherein a void is formed in the insulation material to impede heat from the phase change material from conducting through the insulation material.

2. The phase change memory device of claim 1, wherein the insulation material includes:

at least one layer of insulation material having a hole formed therein, wherein at least a portion of the phase change material is disposed in the hole; and

spacer material disposed in the hole.

3. The phase change memory device of claim 2, wherein the void is formed in the spacer material.

4. The phase change memory device of claim 1, wherein the void is an annularly shaped trench that laterally surrounds at least a portion of the phase change material.

5. The phase change memory device of claim 4, wherein the void is directly adjacent to the phase change material.

6. The phase change memory device of claim 4, wherein the void is indirectly adjacent to the phase change material.

7. The phase change memory device of claim 1, wherein the substrate is semiconductor material having a first conductivity type, and the memory device further comprises:

first and second spaced-apart regions formed in the substrate and having a second conductivity type, with a channel region defined in the substrate therebetween; and

a third block of conductive material disposed over and insulated from the channel region;

wherein the first block is disposed over and electrically connected to the first region.

8. The phase change memory device of claim 2, wherein:

the spacer material has a surface that defines an opening having a width that narrows along a depth of the opening;

the first electrode is a first block of conductive material disposed in the hole;

the phase change material is a layer disposed in the opening and extending along the spacer material surface and along at least a portion of an upper surface of the first block;

the second electrode is a second block of conductive material disposed in the opening and on the phase change material layer; and

the second block of material and the phase change material layer form an electrical current path that narrows in width as the current path approaches the first block upper surface.

9. The phase change memory device of claim 8, wherein the spacer material surface is generally funnel-shaped.

10. The phase change memory device of claim 8, wherein the current path reaches a minimum cross sectional area adjacent the first block upper surface.

11. The phase change memory device of claim 8, wherein the first block of conductive material is disposed in the opening defined by the spacer material surface.

12. The phase change memory device of claim 8, wherein the spacer material is formed over the first block upper surface.

13. The phase change memory device of claim 12, wherein an indentation is formed into the first block upper surface, and a portion of the phase change material layer extends into the indentation.

14. The phase change memory device of claim 13, wherein a portion of the second block extends into the indentation.

15. The phase change memory device of claim 8, wherein the phase change material layer merges together to form a column of the phase change material disposed directly over the first block upper surface.

16. The phase change memory device of claim 15, wherein the current path reaches a minimum cross sectional area at the column.

17. A method of making a phase change memory device, comprising:

forming a first electrode over a substrate;

forming phase change material over the first electrode;

forming a second electrode over the phase change material, wherein electrical current passing through the first and second electrodes and the phase change material generates heat for heating the phase change material;

forming insulation material adjacent to the phase change material; and

forming a void in the insulation to impede heat from the phase change material from conducting through the insulation material.

18. The method of claim 17, wherein the formation of the insulation material includes:

forming at least one layer of insulation material over the substrate;

forming a hole in the layer of insulation material; and

forming spacer material in the hole, wherein at least a portion of the phase change material is formed in the hole and along the spacer material.

19. The method of claim 18, wherein the void is formed in the spacer material.

20. The method of claim 18, further comprising:

performing a planarization etch process to expose an upper portion of the spacer material, wherein the formation of the void includes performing an etch process that removes the exposed upper portion of the spacer material to form the void in the spacer material.

21. The method of claim 20, further comprising:

depositing a poorly conformal insulation layer over the spacer material that seals but does not completely fill the void.

22. The method of claims 17, wherein the void is an annularly shaped trench that laterally surrounds at least a portion of the phase change material.

23. The method of claim 22, wherein the void is directly adjacent to the phase change material.

24. The method of claim 22, wherein the void is indirectly adjacent to the phase change material.

25. The method of claim 17, wherein the substrate is semiconductor material having a first conductivity type, and the method further comprises:

forming first and second spaced-apart regions in the substrate that have a second conductivity type, with a channel region defined in the substrate therebetween, wherein the first block is formed over and electrically connected to the first region; and

forming a third block of conductive material over and insulated from the channel region.

26. The method of claim 18, wherein:

the spacer material is formed with a surface that defines an opening having a width that narrows along a depth of the opening;

the first electrode is formed as a first block of conductive material disposed in the hole;

the phase change material is formed as a layer disposed in the opening and extending along the spacer material surface and along at least a portion of an upper surface of the first block;

the second electrode is formed as a second block of conductive material disposed in the opening and on the phase change material layer; and

the second block of material and the phase change material layer form an electrical current path that narrows in width as the current path approaches the first block upper surface.

27. The method of claim 26, wherein the spacer material surface is formed with a generally funnel shape.

28. The method of claim 26, wherein the current path reaches a minimum cross sectional area adjacent the first block upper surface.

29. The method of claim 26, wherein the first block of conductive material is formed in the opening defined by the spacer material surface.

30. The method of claim 26, wherein the spacer material is formed over the first block upper surface.

31. The method of claim 30, further comprising:

forming an indentation into the first block upper surface, wherein a portion of the phase change material layer extends into the indentation.

32. The method of claim 31, wherein a portion of the second block extends into the indentation.

33. The method of claim 26, wherein the phase change material layer merges together to form a column of the phase change material disposed directly over the first block upper surface.

34. The method of claim 33, wherein the current path reaches a minimum cross sectional area at the column.

35. A method of making a phase change memory device, comprising:

forming insulation material over a substrate;

forming a hole in the insulation material;

forming a first block of conductive material in the hole;

forming a layer of phase change material in the hole and along at least a portion of an upper surface of the first block;

forming a second block of conductive material in the hole and along at least a portion of the phase change material layer, wherein electrical current passing through the first and second blocks and the phase change material layer generates heat for heating the phase change material layer; and

forming a void in the insulation to impede the heat from the phase change material layer from conducting through the insulation material.

36. The method of claim 35, wherein the formation of the insulation material includes:

forming at least one layer of insulation material over the substrate, wherein the hole is formed in the insulation material layer;

forming spacer material in the hole, wherein at least a portion of the phase change material layer is formed along the spacer material.

37. The method of claim 36, wherein the void is formed in the spacer material.

38. The method of claim 36, further comprising:

performing a planarization etch process to expose an upper portion of the spacer material, wherein the formation of the void includes performing an etch process that removes the exposed upper portion of the spacer material to form the void in the spacer material.

39. The method of claim 38, further comprising:

depositing a poorly conformal insulation layer over the spacer material that seals but does not completely fill the void.

40. The method of claims 35, wherein the void is an annularly shaped trench that laterally surrounds at least a portion of the phase change material.

41. The method of claim 40, wherein the void is directly adjacent to the phase change material.

42. The method of claim 40, wherein the void is indirectly adjacent to the phase change material.

43. The method of claim 35, further comprising:

forming first and second spaced-apart regions in the substrate that have a conductivity type different from that of the substrate, wherein a channel region of the substrate is defined between the first and second regions; and

forming a third block of conductive material over and insulated from the channel region;

wherein the formation of the first block includes forming the first block over and electrically connected with the first region.

44. The method of claim 36, wherein:

the spacer material is formed with a surface that defines an opening having a width that narrows along a depth of the opening;

the layer of phase change material is formed in the opening and extends along the spacer material surface; and

the second block of material and the layer of phase change material form an electrical current path that narrows in width as the current path approaches the first block upper surface.

45. The method claim 44, wherein the spacer material surface is formed with a generally funnel-shape.

46. The method of claim 44, wherein the current path reaches a minimum cross sectional area adjacent the first block upper surface.

47. The method of claim 44, wherein the formation of the first block is performed after the formation of the spacer material such that the first block is formed in the opening defined by the spacer material surface.

48. The method of claim 44, wherein the formation of the first block is performed before the formation of the spacer material such that the spacer material is formed over the first block upper surface.

49. The method of claim 48, further comprising:

forming an indentation into the first block upper surface, wherein a portion of the phase change material layer extends into the indentation.

50. The method of claim 49, wherein a portion of the second block extends into the indentation.

51. The method of claim 44, wherein the phase change material layer is formed to merge together and form a column of the phase change material disposed directly over the first block upper surface.

52. The method of claim 51, wherein the current path reaches a minimum cross sectional area at the column.

53. An array of phase change memory devices, comprising:

a substrate;

a plurality of first electrodes disposed over the substrate;

phase change material disposed over and in electrical contact with the first electrodes;

a plurality of second electrodes disposed over and in electrical contact with the phase change material, wherein electrical current passing through the first and second electrodes and the phase change material generates heat for heating the phase change material; and

insulation material disposed adjacent to the phase change material, wherein a plurality of voids are formed in the insulation material to impede heat from the phase change material from conducting through the insulation material.

54. The array of claim 53, wherein the insulation material includes:

at least one layer of insulation material having a plurality of holes formed therein, wherein at least portions of the phase change material are disposed in the holes; and

spacer material disposed in the holes.

55. The array of claim 54, wherein the voids are formed in the spacer material.

56. The array of claim 53, wherein the voids are annularly shaped trenches that laterally surround portions of the phase change material.

57. The array of claim 56, wherein the voids are directly adjacent to the phase change material.

58. The array of claim 56, wherein the voids are indirectly adjacent to the phase change material.

59. The array of claim 53, wherein the substrate is semiconductor material having a first conductivity type, and the array further comprising:

a plurality of first and second spaced-apart regions formed in the substrate and having a second conductivity type, with channel regions of the substrate defined between the first and second regions; and

a plurality of third blocks of conductive material each disposed over and insulated from one of the channel regions;

wherein the first blocks are each disposed over and electrically connected to one of the first regions.

60. The array of claim 54, wherein:

the spacer material includes surfaces that define openings having widths that narrow along depths of the openings;

the first electrodes are first blocks of conductive material each disposed in one of the holes;

the phase change material extends along the spacer material surfaces and along at least portions of upper surfaces of the first blocks;

the second electrodes are second blocks of conductive material disposed in the openings and on the phase change material; and

the second blocks of material and the phase change material form electrical current paths that narrow in width as the current paths approach the first block upper surfaces.

61. The array of claim 60, wherein the spacer material surfaces are generally funnel-shaped.

62. The array of claim 60, wherein the current paths reach minimum cross sectional areas adjacent the first block upper surfaces.

63. The array of claim 60, wherein the first blocks of conductive material are disposed in the opening defined by the spacer material surfaces.

64. The array of claim 60, wherein the spacer material is formed over the first block upper surfaces.

65. The array of claim 65, wherein indentations are formed into the first block upper surfaces, and portions of the phase change material extend into the indentations.

66. The array of claim 66, wherein portions of the second blocks extend into the indentations.

67. The array of claim 60, wherein the phase change material is at least one layer of material that merges together to form columns of the phase change material disposed directly over the first block upper surfaces.

68. The array of claim 67, wherein the current paths reach minimum cross sectional areas at the columns.

69. A method of making an array of phase change memory devices, comprising:

forming first electrodes over a substrate;

forming phase change material over the first electrodes;

forming second electrodes over the phase change material, wherein electrical current passing through the first and second electrodes and the phase change material generates heat for heating the phase change material;

forming insulation material adjacent to the phase change material; and

forming voids in the insulation to impede heat from the phase change material from conducting through the insulation material.

70. The method of claim 69, wherein the formation of the insulation material includes:

forming at least one layer of insulation material over the substrate;

forming a plurality of holes in the layer of insulation material; and

forming spacer material in the holes, wherein at least portions of the phase change material are formed in the holes and along the spacer material.

71. The method of claim 70, wherein the voids are formed in the spacer material.

72. The method of claim 70, further comprising:

performing a planarization etch process to expose upper portions of the spacer material, wherein the formation of the voids include performing an etch process that removes the exposed upper portions of the spacer material to form the voids in the spacer material.

73. The method of claim 72, further comprising:

depositing a poorly conformal insulation layer over the spacer material that seals but does not completely fill the voids.

74. The method of claims 69, wherein the voids are annularly shaped trenches that laterally surround at least portions of the phase change material.

75. The method of claim 74, wherein the voids are directly adjacent to the phase change material.

76. The method of claim 74, wherein the voids are indirectly adjacent to the phase change material.

77. The method of claim 69, wherein the substrate is semiconductor material having a first conductivity type, and the method further comprises:

forming a plurality of first and second spaced-apart regions in the substrate that have a second conductivity type, wherein channel regions of the substrate are defined between the first and second regions, and wherein the first blocks are formed over and electrically connected to the first regions; and

forming third blocks of conductive material over and insulated from the channel regions.

78. The method of claim 70, wherein:

the spacer material is formed with surfaces that define a plurality of openings each having a width that narrows along a depth of the opening;

the first electrodes are formed as first blocks of conductive material disposed in the holes;

the phase change material extends along the spacer material surfaces and along at least a portion of upper surfaces of the first blocks;

the second electrodes are formed as second blocks of conductive material disposed on the phase change material; and

the second blocks of material and the phase change material form electrical current paths that narrow in width as the current paths approach the first block upper surfaces.

79. The method of claim 78, wherein the spacer material surfaces are formed with generally funnel shapes.

80. The method of claim 78, wherein the current paths reach minimum cross sectional areas adjacent the first block upper surfaces.

81. The method of claim 78, wherein the first blocks of conductive material are formed in the openings defined by the spacer material surfaces.

82. The method of claim 78, wherein the spacer material is formed over the first block upper surfaces.

83. The method of claim 82, further comprising:

forming indentations into the first block upper surfaces, wherein portions of the phase change material extend into the indentations.

84. The method of claim 83, wherein portions of the second blocks extend into the indentations.

85. The method of claim 78, wherein the phase change material includes at least one layer of material that merges together to form columns of the phase change material disposed directly over the first block upper surfaces.

86. The method of claim 85, wherein the current paths reach minimum cross sectional areas at the columns.